IMPLEMENTATION OF SCIENTIFIC APPROACH BASED MIND MAPPING TO IMPROVE MATHEMATIC PROBLEM SOLVING ABILITY OF STUDENTS IN JUNIOR HIGH SCHOOL

PUBLICATION ARTICLE

Submitted as Partial Fulfillment of the Requirements
To Getting Bachelor Degree of Education
In Mathematics Department

By:

Yotam Agung Pratama

A 410 102 005

FACULTY OF TEACHER TRAINING AND EDUCATION
MUHAMMADIYAH UNIVERSITY OF SURAKARTA
2015

UNIVERSITAS MUHAMMADIYAH SURAKARTA
FAKULTAS KEGURUAN DAN ILMU PENDIDIKAN
Jl. A. Yani Tromol Pos I Pabelan Kartasura Tlp. (0271) 717417, 719483, Fax. (0271) 715448 Surakarta 57102

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NIK : 403

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Nama : Yotam Agung Pratama

NIM : A 410 102 005

Program Studi : Mathematics

Judul Skripsi : **PENERAPAN PENDEKATAN SAINTIFIK BERBASIS *MIND MAPPING* UNTUK MENINGKATKAN KEMAMPUAN PEMECAHAN MASALAH MATEMATIKA (PTK Pada Siswa Kelas VII A SMP Muhammadiyah 5 Surakarta Tahun Ajaran 2014/2015)**

Naskah artikel tersebut layak dan dapat disetujui untuk dipublikasikan.

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NIK. 403

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By:

Yotam Agung Pratama[1] and Nining Setyaningsih[2]
[1]Student of Mathematics Department of UMS, yoatm.agung@gmail.com
[2]Lecturer Staff of Mathematics Department of UMS, ningsetya@yahoo.com

ABSTRACT

The goal of this research is to improve students' mathematics problem solving abilities by applying a scientific approach based Mind Mapping. This research is a classroom action research. Subject recipient of action that students of grade VII A of Muhammadiyah 5 Surakarta Junior High School totaling 32 students and giver of action that is the subject of mathematics teachers who collaborate with researchers. A method of data collection is done by observation, documentation, test questions and field record sheet. A technique of data analysis consists of: data reduction, data presentation and conclusion. The results showed an increase in students' mathematical problem solving ability through scientific approaches based Mind Mapping. It can be seen from the increase in the percentage of indicators mathematical problem solving abilities, that is (1) the ability to understand the problems of an increase of (53.125%), before the action (31.25%) increased to (84.375%); (2) the ability of the completion strategy planned an increase of (59.375%), before the action (18.75%) increased to (78.125%); (3) ability to implement strategies to solving issue an increase of (55.75%), before the action (12.5%) increased to (68.25%); and (4) conduct re-examination of the answers given an increase of (59.375%), before the action (0%) increased to (59.375%). From these results it can be concluded that the application of the scientific approach based Mind Mapping can improve students' mathematics problem solving ability in mathematics.

Keywords: *scientific, Mind Mapping, problem-solving abilities*

INTRODUCTION

In learning mathematics, students are required to have a useful problem-solving ability to solve math problems. Problem-solving approach is the focus in the learning of mathematics that includes a closed issue, have a single solution and solving problems with various ways of solving problems. David A. Jacobsen (2009) stated that the problem-solving steps are: identifying and confirms

problems, choose a strategy, implement the strategy, and evaluate the results can help students become problem solvers (problem solver) a more systematic and analytical and more aware of their own thinking as a problem solver.

Based on observations conducted by researchers at Muhammadiyah 5 Surakarta Junior High School grade VII A, there are problems in the completion of the students do math problems. Lack of mathematical problem solving ability can be seen from the indicators solving mathematical problems as follows: 1) The ability to identify the elements that are known and asked in a matter of 31.25%, 2) Ability to plan strategies completion of 18.75%, 3) ability to implement strategies solving problems 12.5%, 4) To examine the answers given back to 0%.The root problem in this research is a learning process that is not appropriate in a teaching and learning activities in the classroom, so that students have difficulty in solving the settlement issue.

Selection of learning models to be precise with the right approach anyway. One of the approaches and learning model that can be applied to problems in Muhammadiyah 5 Surakarta Junior High School grade VII A is scientific approach based Mind Mapping. Scientific approach in learning characterized by protrusion dimension of observation, reasoning, discovery, validation, and an explanation of a truth. Scientific approach to teaching all subjects include digging through observation, questioning, experimentation and then process the data, presenting data then analyze, reason, conclude and create (Kementrian Pendidikan dan Kebudayaan, 2013).

Mind Mapping method is a method that can grow and develop the ability to collate information that can assist in the process of thinking about a math problem solving. Mind Mapping method can be used or useful for a wide range of fields, including education. The usefulness of the Mind Mapping method in the field of education: a) Providing a holistic view of the subject matter. b) Allows us to plan a route or framework of a bouquet. c) Collecting large amounts of data in one place. d) Encouraging with creative problem solving. There are four steps that must be done based learning Mind Mapping process: 1)Overview, 2)Preview, 3)Inview, 4)Review. (Michael Michalko in Buzan, 2011)

Based on the description above, the scientific approach is based Mind Mapping is expected to improve math problem solving ability of students, provided the teacher should be able to apply the learning model approaches and correctly according to the steps and approaches that model.

The expected goal of this research is to improve mathematical problem solving through a scientific approach based Mind Mapping in Muhammadiyah 5 Surakarta Junior High School grade VII A Even Semester in Year 2014/2015.

RESEARCH METHODS

Research conducted at Muhammadiyah 5 Surakarta Junior High School grade VII A Even Semester in Year 2014/2015, total of 32 students. The research was conducted from January 2015. Researcher preparation, execution and data analysis with the mathematics teacher. The subjects were students as the subject of a class action receiver and math teacher of Muhammadiyah 5 Surakarta Junior High School as the giver of action.

This type of research is Classroom Action Research (CAR) collaboratively between the mathematics teachers and researchers. The teacher's role here is as a practitioner of learning, while designers and researchers as observers. Teachers involved from the planning, implementation, observation, until reflection. The research activities in CAR departs from the real problems faced by teachers in the learning process, then reflected an alternative solutions to the problem and followed up with concrete actions planned and measured (Sutama, 2010: 134). If the program has not been able to solve the existing problems, it is necessary to the next cycle (second cycle) to try other measures.

This research is a class act who wants an increase in the maximum results in mathematical problem solving ability of students. Class teachers and researchers involved from: 1) the initial dialog, 2) planning action, 3) implementation of the action, 4) observation and monitoring, 5) reflection and evaluation, 6) inference, action research is descriptive qualitative. The primary data source is the researchers who conducted the action, while the secondary data documentation.

Data retrieval can be done by observation, field notes, and documentation and test methods. Research instruments developed by researchers with the teachers of mathematics with maintaining the validity of data. The research instrument used in this study is the observation guide, blank field notes, test sheet. Note this field in the form of additional notes about the events that occur in every action, while documentation in the form of a list of names of students, lesson plans and photographs of the study.

Data were analyzed using the process of data analysis, data presentation, and data verification. Data analysis process starts with examining all available data from various sources, obtained from preliminary observation, documentation, and field notes. At this stage of presentation of the data, the researchers tried to compile the relevant data so that it can be concluded that information and have a specific meaning. While the data verification is done is done in every action that eventually combined into a conclusion.

RESULTS AND DISCUSSION

Before doing research in Muhammadiyah 5 Surakarta Junior High School grade VII A, the researchers conducted observations and initial dialogue with the grade VII A math teacher who discusses the mathematical problem solving abilities in learning. This observation aims to find out the problems faced by teachers and students in the learning process. This dialogue resulted in an agreement that: 1) Efforts to improve problem-solving skills students need to be done, 2) Identify the problems that allegedly become an obstacle in developing students 'problem-solving abilities, 3) alternative learning practiced in an effort to improve students' problem-solving abilities of Muhammadiyah 5 Surakarta Junior High School grade VII A in mathematics learning is through a scientific approach based Mind Mapping.

From the beginning of the observation and dialogue obtained problems in mathematical problem solving ability. Of the 32 students including 1) the ability to identify the elements that are known and asked in question amounted to 31.25%, 2) Ability to plan strategies completion of 18.75%, 3) The ability to

implement strategies to solve problem by 12.5%, 4) To examine the answers given back to 0%.

Implementation of the first cycle class actions performed during two meetings. The material taught is about one variable linear inequality systems with time-bound, 3x40 minutes of the first meeting and 2x40 minutes in the second meeting. The first meeting was held on Tuesday, February 17, 2015 and the second meeting held on Wednesday, February 18, 2015.

Implementation of the second cycle of class actions performed during two meetings. The material taught is about social arithmetic with 3x40 minute time allocation at the first meeting and 2x40 minutes in the second meeting. The first meeting was held on Tuesday, February 24, 2015 and the second meeting held on Wednesday, February 25, 2015.

Based on research that has been conducted by researchers through a class action cycle I to cycle II class actions by using a scientific approach based Mind Mapping, researchers and classroom teachers concluded that the mathematical problem solving abilities increase. Improved mathematical problem solving ability of prior action until the second cycle can be presented in tabular form below.

Table 1.

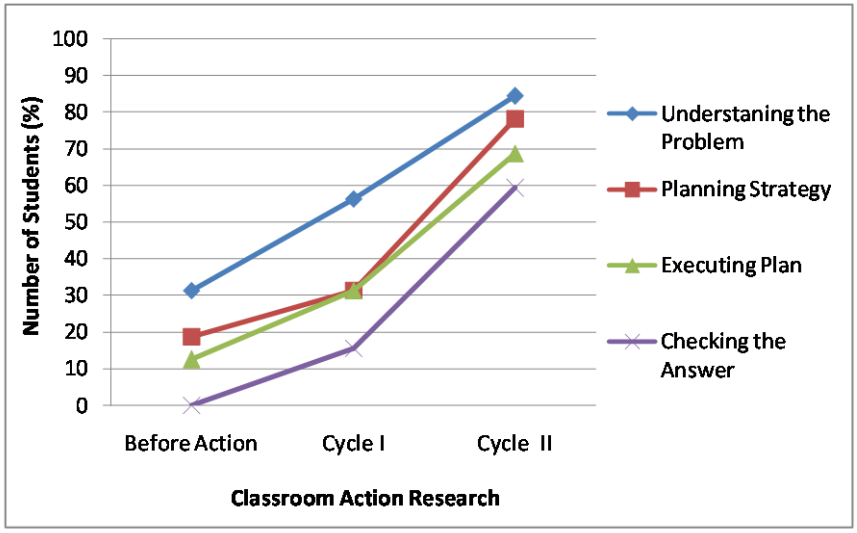
Result Data of Problem Solving Ability Improvements

Indicators	**Percentage (Number of Students)**		
	Prior Actions	**Cycle I**	**Cycle II**
Understanding the problem	31,25% (10 students)	56,25% (18 students)	84,375% (27 students)
Planning strategy	18,75% (6 students)	31,25% (10 students)	78,125% (25 students)
Executing plan	12,5% (4 students)	31,25% (10 students)	68,75% (22 students)
Checking the answer	0% (0 student)	15,625% (5 students)	56,67% (19 students)

The graph increase problem solving ability of students before and after class actions can be presented in the following figure:

Figure 1.

Graph of Problem Solving Ability Improvements



According to the table 1 and figure 1 it can be concluded that the scientific approach based Mind Mapping can improve mathematical problem solving at grade VII A of Muhammadiyah 5 Surakarta Junior High School. This can be seen by an increase in indicators of mathematical problem solving ability used by researchers. This enhancement can improve students' skills in math problems solving. The following analysis of mistakes made by the students, factors increase problem-solving abilities, as well as indicators of mathematical problem solving ability have increased:

1) Students Ability in Understanding the Problem

This step is very critical to the success obtain solutions to problems. This step involves the deepening of the problem situation, perform sorting the facts, determine relationships between facts and formulate questions matter. Each issue is written, even the most simple to be read repeatedly and the information contained in the problem studied carefully. Usually students need to restate the

problem in their own language. Imagine a situation in mind problems is also very helpful to understand the structure of matter (Sri Wardhani, 2010: 35).

On the analysis of student work, stating that there are still many students who do mistakes on indicators to understand the problem, most students are not appropriate in writing what is known and asked the question, as shown in the following figure:

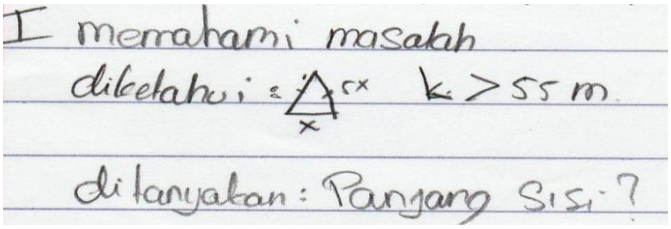


Figure 2.Uncorrect Step of Understand Issues

Stage observed in scientific approach encourages students to undertake a thorough observations on the matter and also about, which can help improve the ability to understand the problems. Indicators understand these problems can be said to increase, judging from prior acts only 31.25% of students were able to understand the problem, but after the class action cycle I and cycle II there was an increase of 56.25% to 84.375% of the students. In this study, it can be seen that after the action, problem solving skills of students in the indicators to understand the problem is said to increase after application of a scientific approach based Mind Mapping assisted problem solving steps belongs to Polya.

2) Students Ability in Planning Strategy

This step needs to be done with confidence when the problem has been understood. Plan solution built with considering the structure of issues and questions to be answered. If the problem is a matter of routine with the task of writing an open mathematical sentence, it is necessary to translation problems into mathematical language (Sri Wardhani, 2010: 35).

On the analysis of student work, stating that there are still many students who do mistakes in the settlement plan indicators, most students have not been

able to write a complete planning strategy and coherent as shown in the following figure:

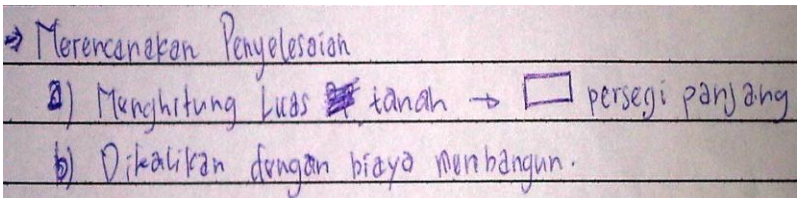


Figure 3.Uncorrect Step of Planning Strategy

Stage reasoning in the scientific approach assisted with Mind Mapping is able to train students to collect information materials into the mind map summary form in accordance with the powers of imagination and perception of students so that students are able to create a path or steps in solving a problem, it can improve the ability to plan settlement about. On this indicator before action is only 18.75% of students who are able to plan completion, but after the class action cycle I and cycle II there was an increase of 31.25% to 78.125% of the students. In this study, it can be seen that after the action, problem solving skills of students in planning indicator is said to increase after the completion of applied scientific approach based Mind Mapping assisted problem solving steps belongs to Polya.

3) Students Ability to Implement the Planning Strategy

To find the right solution, a plan that has been created in step 2 should be implemented with caution. To get started, sometimes need to make estimates of the solution. Diagrams, tables or sequence of carefully constructed so that students will not be confused. If the solution requires computational, most students will use a calculator to compute than calculating with paper and pencil, and reduce concerns that often occurs in problem solving. If inconsistencies arise when implementing the plan, the process should be reviewed to find the source of his troubles (Sri Wardhani, 2010: 35).

On the analysis of student work, stating that there are still many students who do mistakes on indicators implement the plan, since most students have not been able to make a plan with the right, then in resolving the matter has not exactly as shown in the following figure:

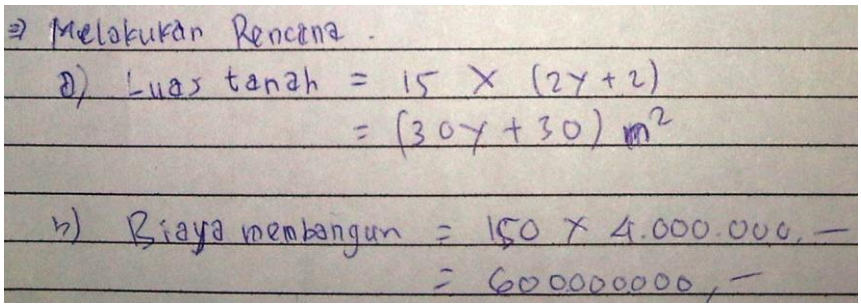


Figure 4.Uncorrect Step of Implement Planning Strategy

The ability to understand the problems and plan completion support, boost students' skills in carrying out planning and solving problems according to plan. On this indicator before action is only 12.5% of students were able to implement the settlement plan, but after the class action cycle I and cycle II there was an increase from 31.25% to 68.75% of the students. In this study, it can be seen that after the action, problem solving skills of students in the indicators of implementing the plan is said to increase after application of a scientific approach based Mind Mapping assisted problem solving steps belongs to Polya.

4) Students Ability to Checking the Answer

During this step, the solution to the problem must be considered. Calculations should be rechecked. Checking behind would involve determining the accuracy of calculations by means of recalculating. If making estimates or forecasts, then compare it with the results. The breakdown must still match the root of the problem although it does not seem unreasonable. Important part of this step is to make the expansion issue involving the search of alternative solutions (Sri Wardhana, 2010: 35).

On the analysis of student work, stating that there are still many students who do mistakes in checking indicators, most students have not looked back answers that have been obtained and make conclusions based on the given problem as shown in the following figure:

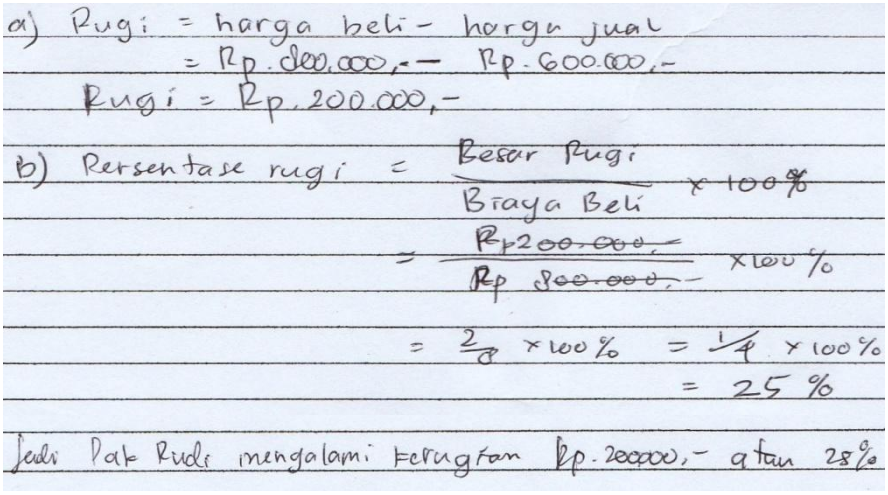


Figure 5.Uncorrect Step of Perform Checks

Phase concluded in the scientific approach to familiarize students looking back answers and make conclusions from the answers given, it increases the ability of students to check back the answers given. On this indicator before action 0% of the students who do the checking, but after the first cycle of the class action and the second cycle increased from 15.625% to 56.67% of the students. In this study, it can be seen that after the action, problem solving skills of students in checking said indicator increased after applied scientific approach based Mind Mapping assisted problem solving steps belongs to Polya.

Based on the above explanation that supports researchers conducted the study and based on the formulation of the problem as formulated by the researchers concluded that the hypothesis is accepted that scientific approach based Mind Mapping can improve the ability of mathematical problem solving in grade VII A of Muhammadiyah 5 Surakarta Junior High School Even Semester in Year 2014/2015.

CONCLUSION

This research is a class act on the application of the scientific approach based Mind Mapping to improve mathematical problem solving ability of students of grade VII A of Muhammadiyah 5 Surakarta Junior High School.

The results were conducted by researchers who collaborate with teachers of mathematics concluded an increase in students' mathematical problem solving ability through scientific approaches based Mind Mapping seen from the following indicators:

1) The ability to identify the elements that are known and asked in question are 31.25% (10 students), after the first cycle of action are 56.25% (18 students) and in the second cycle are 84.375% (27 students),
2) The ability to planning strategy are 18.75% (6 students), after the first cycle of action are 31.25% (10 students) and the second cycle are 78.125% (25 students),
3) Ability to implement planning strategy of solving problem are 12.5% (4 students), after the first cycle of action are 31.25% (10 students) and the second cycle are 68.25% (22 students).
4) Checking the Answers is 0% (0 students), after the first cycle of action are 15.625% (5 students) and in the second cycle are 59.375% (19 students).

REFERENCES

Buzan, Tony. 2011. *Buku Pintar Mind Map*. Jakarta : PT. Gramedia Pustaka Utama.

David A. Jacobsen, dkk. 2009. "Methods for Teaching, Metode-metode Pengajaran, Meningkatkan Belajar Siswa TK – SMA". Yogyakarta : Pustaka belajar

Kemendikbud. 2013. *Materi Pelatihan Implementasi Kurikulum 2013*. Bandung: PT. Remaja Rosdakarya Offset

Polya, G (1985). *How to Solve It . A New Aspect of Mathematical Method (2nd ed)*. Princeton, New Jersey : Princeton University Press.

Sutama. 2010. "Penelitian Tindakan Teori dan Praktek dalam PTK, PTS, dan PTBK". Semarang: Surya Offset.

Wardhani, Sri dkk. 2010. Pembelajaran Kemampuan Pemecahan Masalah Matematika di SD. Jakarta : Pusat Pengembanga dan Pemberdayaan Pendidik dan Tenaga Kependidikan (PPPPTK) Matematika.